

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In the Patent Application of:

KURT HAKAN CARLSSON ET AL.

Serial No.: 10/708,533

Filed: March 10, 2004

For: DISTRIBUTED MICROWAVE
SYSTEM

Group Art Unit: 3742

Examiner: Leung, Philip H.

APPEAL BRIEF
(Amended)

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an Appeal Brief pursuant to 37 C.F.R. §41.37 in support of Applicants' appeal of the Final Rejection of the Examiner, mailed December 27, 2005, of claims 21-70. Each of the topics required by 37 C.F.R. §41.37 is presented herewith and is labeled appropriately.

I. REAL PARTY IN INTEREST

Whirlpool Corporation, having offices in Benton Harbor, Michigan ("Whirlpool" or "Assignee") is the real party in interest of the present application. An assignment of all rights in the present application to Whirlpool was executed by the inventors and recorded in the U.S. Patent and Trademark Office at Reel 016878, Frame 0617.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to the present application of which Appellants, Appellants' legal representatives, or Assignee are aware.

III. STATUS OF CLAIMS

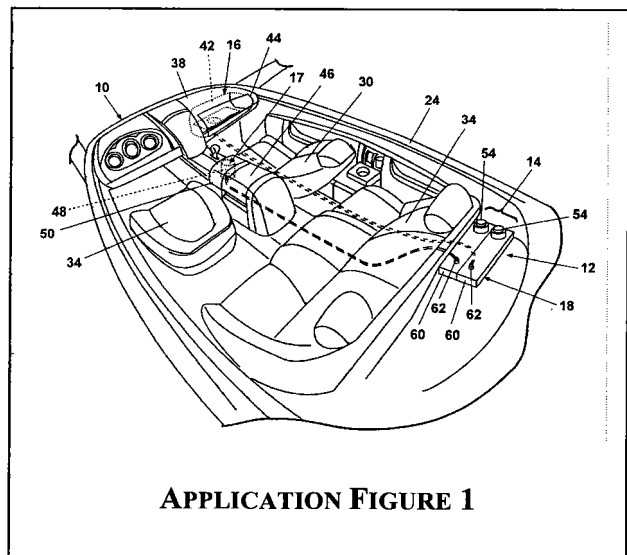
Claims 1-70 were in the application as filed. Claims 1-20 were previously cancelled without prejudice. Claims 21-70, which are presented in the Appendix, are pending in the application and have been twice rejected by the Examiner. Accordingly, Appellants hereby appeal the final rejection of claims 21-70.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to final rejection, and all amendments have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As illustrated in Figure 1 of the Application, claim 21 calls for a vehicle 10 in combination with a distributed microwave cooking system 12 comprises a microwave cooking element 16 located within the vehicle 10 and accessible by a user of the vehicle. *Pg. 10, ln. 6-8.* A microwave generator 14 is located within the vehicle 10 and remotely spaced from the microwave cooking element 16. *Pg. 10, ln. 8-13.* A microwave conduit 18 connects the microwave generator 14 to the microwave cooking element 16 such that the microwaves generated by the microwave generator 14 are directed to the microwave cooking element 16 through the microwave conduit 18 to cook an item with the microwave

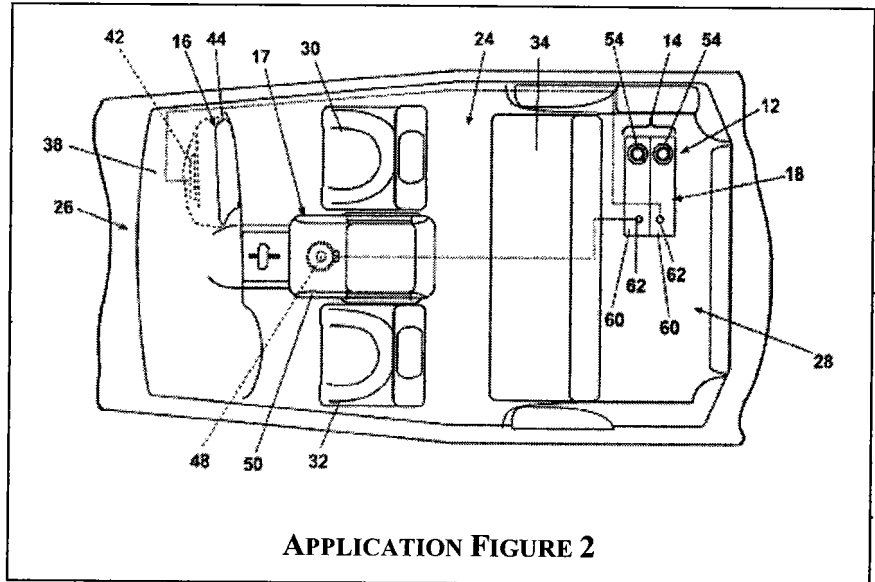


cooking element 16. *Ibid.*

As illustrated in Figures 1 and 2, claim 51 calls for a microwave cup warmer for a vehicle comprises a microwave cooking element 17 for warming the contents of a cup. *Pg. 12, ln. 1-11.*

A microwave generator 14 is located remotely from the microwave cooking element 17.

Pg. 10, ln. 8-13. A microwave conduit 18 connects the microwave



generator 14 to the microwave cooking element 17 such that the microwaves generated by the microwave generator 14 are directed to the microwave cooking element 17 through the microwave conduit 18 to cook an item with the microwave cooking element 17. *Ibid.*

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

In the Office Action of December 27, 2005, the Examiner rejected claims 21-70 under 35 U.S.C. §103(a), as follows:

- Claims 21, 29-37, 50-52, and 70 as allegedly obvious over Japanese Unexamined Application No. 1-30194 to Nakagawa ("Nakagawa") in view of U.S. Patent No. 6,060,700 to Perlman ("Perlman") or U.S. Patent No. 6,759,636 to Stutman ("Stutman");
- Claims 22-28, 38-43, and 53-63 as allegedly obvious over Nakagawa in view of Perlman or Stutman, and further in view of U.S. Patent No. 4,323,745 to Berggren ("Berggren");
- Claims 44-49 and 64-69 as allegedly obvious over Nakagawa in view of Perlman or Stutman, and further in view of U.S. Patent No. 5,315,084 to Jensen ("Jensen") or U.S.

Patent No. 4,814,570 to Takizaki ("Takizaki").

Appellants disagree with the Examiner's assertion that the Nakagawa, Perlman, Stutman, Berggren, Jensen, or Takizaki references render claims 21-70 obvious to one skilled in the art.

VII. ARGUMENT

A. Claims 21, 29-37, 50-52, and 70 are not obvious over Japanese Unexamined Application No. 1-30194 to Nakagawa in view of U.S. Patent No. 6,060,700 to Perlman or U.S. Patent No. 6,759,636 to Stutman.

1. The combination of Nakagawa, Perlman, and Stutman is improper, which removes the basis for the obviousness rejection.

Nakagawa discloses a microwave oscillator 1 attached to one end of a waveguide 4.¹ The other end of the waveguide 4 is branched into a plurality of waveguides, each of which connects to a separate heating chamber 9, 10. An isolator 3 branches off the waveguide 4 between the oscillator 1 and the branched end of the waveguide 4. Shutters 5, 6 that are selectively openable and closeable are installed at each branch in the waveguide 4. The shutters 5, 6 are selectively opened and closed to selectively supply microwaves from the microwave oscillator 1 to one or the other heating chamber 9, 10. The isolator 3 blocks microwaves reflected up the waveguide 4 from the heating chambers 9, 10 toward the oscillator 1.

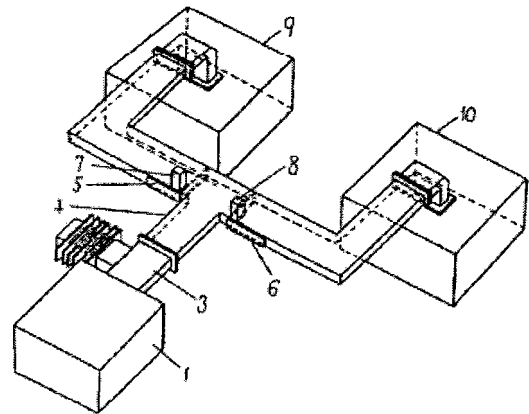


FIGURE 1 OF NAKAGAWA '194

The stated purpose of the invention is "to block the microwaves reflected back from the

¹ A translation of Nakagawa is attached hereto as Appendix A. The untranslated publication of Nakagawa is also attached hereto as Appendix B.

microwave heating chambers” through the incorporation of the isolator into the waveguide. *See, Translation, p. 3, Appendix A.*

Perlman discloses a fully-integrated, self-contained microwave oven 10 adapted for use within a dashboard space 12, which is provided by eliminating the glove box. The microwave oven 10 appears from the Description to have a generally conventional design, but with relatively smaller dimensions to enable its

mounting in the glove box area. Food items are heated by a microwave-generating magnetron, which appears from the Description to be incorporated into the oven in a conventional manner, i.e. within the oven housing adjacent the cooking chamber. There is nothing in Perlman to suggest that the magnetron is remote from the rest of the oven, or not enclosed with the cooking chamber within the oven housing.

The oven is sized to accommodate several beverage cups or heat-and-serve frozen dinners. *Col. 7, ln. 20-22.* The oven also comprises a removable storage cassette that can be inserted into the cooking chamber to hold items typically stored in a glove compartment when the oven is not in use. When the oven is to be used, the storage cassette is closed by a door and removed from the cooking chamber with the stored items securely retained therein. *Col. 7, ln. 4-7.*

Stutman discloses a portable, self-contained microwave oven that can be strapped to a vehicle seat with seatbelts and is powered by the vehicle's cigarette lighter socket. A magnetron 100 is contained within the oven cabinet

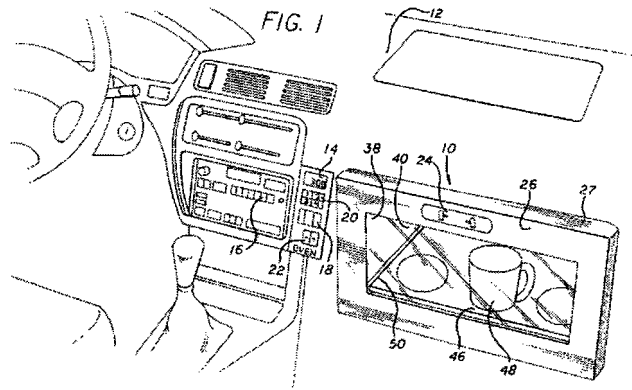


FIGURE 1 OF PERLMAN '700

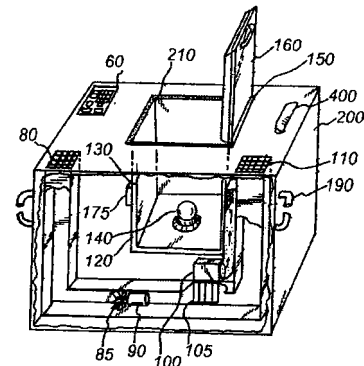


FIGURE 2 OF STUTMAN '636

200 adjacent a cooking cavity 120. There is nothing in Stutman to suggest that the magnetron 100 is remote from the rest of the oven, or not enclosed with the cooking cavity 120 within the oven housing 200.

The following rules for combining prior art references for a finding of obviousness apply to the grounds of rejection.

A claimed invention is unpatentable if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art....The ultimate determination of whether an invention would have been obvious under 35 U.S.C. §103(a) is **a legal conclusion based on underlying findings of fact.**²

A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field....Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher."

Most if not all inventions arise from a combination of old elements....Thus, every element of a claimed invention may often be found in the prior art....However, **identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention**....Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, **there must be some motivation, suggestion or teaching of the desirability of making the specific combination** that was made by the applicant....Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference.

² The underlying factual inquiries include (1) the scope and content of the prior art; (2) the level of ordinary skill in the prior art; and (3) the differences between the claimed invention and the prior art. *Graham v. John Deere Co.*, 383 U.S. 1, 17, 15 L. Ed. 2d 545, 86 S. Ct. 684 (1966).

The motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved....In addition, the teaching, motivation or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references....The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art....Whether the Patent Office Examiner relies on an express or an implicit showing, **the Examiner must provide particular findings related thereto....Broad conclusory statements standing alone are not "evidence."**

In Re Werner Kotzab, 217 F.3d 1365; 55 U.S.P.Q.2d (BNA) 1313 (Fed. Cir. 2000) (citations omitted).

The Examiner has failed to identify any motivation, suggestion, or teaching of the desirability of combining Nakagawa with either Perlman or Stutman to arrive at Applicants' invention. There has been no statement identified in the prior art, there has been no discussion of the knowledge of one of ordinary skill in the art or the nature of the problem to be solved, there has been no identification of what the combined teachings, the knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to one of ordinary skill in the art as required for a showing of motivation. The Examiner has failed to provide any particular findings related to any motivation, suggestion, or teaching of the desirability of combining Nakagawa with either Perlman or Stutman. Rather, the Examiner has simply relied upon "broad conclusory statements standing alone," which can only lead to the conclusion that the Examiner is simply relying on impermissible hindsight reconstruction of Applicants' invention.

In fact, Perlman teaches away from the desirability of modifying the invention described therein with a microwave generator remotely spaced from a microwave cooking element, as required in claims 21 and 51. The microwave oven described in Perlman is conceived as a fully functional microwave oven no different than a household microwave oven other than its smaller size. Furthermore, Perlman discloses that the oven is capable of heating multiple food items.

Thus, there is no motivation, suggestion, or teaching in Perlman for multiple cooking chambers.

Similarly, Stutman discloses a fully functional, portable microwave which can be powered through a vehicle cigarette lighter socket or a power supply remotely located from the vehicle. There is no motivation, suggestion, or teaching in Stutman for multiple cooking chambers.

Finally, Nakagawa discloses a microwave oscillator connected to a pair of cooking chambers through a branched waveguide. The inventive concept in Nakagawa is the use of an isolator to prevent reflected microwaves from impacting the oscillator. There is no motivation, suggestion, or teaching in Nakagawa for modifying the microwave device for vehicular use. Further, Nakagawa does not disclose a microwave oven in a vehicle, or address the problems of placing a microwave oven in a vehicle.

The Examiner supports the rejection by asserting that it would have been obvious to a person of ordinary skill in the art at the time of invention "to modify Nakagawa to use its device in a vehicle for heating food or beverages as a cup warmer to increase its utilities, in view of the teaching of Perlman or Stutman. The exact connection and location of the cooking elements would have been a matter of engineering expediency depending on the overall structure of the vehicle." *12/27/05 Office Action, pp. 2-3*. The Examiner's assertion is without merit.

The Examiner's rationale argues against the combination. Both Perlman and Stutman alone are expressly described to be used in a vehicle for heating food or beverages. Thus, according to the Examiner's rationale, Nakagawa is unnecessary, and need not be combined with either Perlman or Stutman to accomplish the Examiner's asserted motivation for making the combination.

Moreover, the Examiner's assertion that the connection and location of the cooking elements would have been a matter of engineering expediency is unsupported and cannot be sustained. The Examiner has not defined "engineering expediency," and the MPEP contains no such terminology. The Examiner has done no more than cite "engineering expediency" without

defining the meaning of the term or offering any factual support for the assertion. Furthermore, "The mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in the reference device." *Ex parte Chicago Rawhide Mfg. Co.*, 223 USPQ 351, 353 (Bd. Pat. App. & Inter. 1984). No meaningful motivation or reason has been offered, as discussed above. Indeed, because Perlman and Stutman are capable of use in a vehicle for heating food or beverages, there is no reason to combine either of them with Nakagawa. Thus, the Examiner's rationale for concluding that Nakagawa in view of Perlman or Stutman renders claims 21 and 51 obvious cannot be sustained.

None of the three references discloses any motivation, suggestion, or teaching that would warrant their combination. The Examiner is simply relying on hindsight reconstruction of Applicants' invention and after-the-fact rationalization, both of which are improper and should be rejected. Thus, the Examiner's justification for combining Nakagawa with either Perlman or Stutman is flawed and should be rejected.

2. Claims 21, 29-37, 50-52, And 70 Are Not Obvious In View Of The Combination Assuming It Can Be Made.

The most that the combination of Nakagawa with Perlman or Stutman teaches is a generally conventional microwave oven that is adapted for use in a motor vehicle, and which comprises an enclosure comprising at least one heating chamber and one or more waveguides interconnected to an oscillator/magnetron. This is not the invention of claims 21, 29-37, 50-52, or 70.

3. The Combination Of Nakagawa with Perlman or Stutman Fails To Reach The Claimed Invention of Independent Claim 21.

Claim 21 is one of two independent claims in the Application, and is directed to a vehicle in combination with a distributed microwave cooking system. A microwave cooking element is

located within the vehicle and accessible by a user of the vehicle. A microwave generator is located within the vehicle and remotely spaced from the microwave cooking element. A microwave conduit connects the microwave generator to the microwave cooking element such that the microwaves generated by the microwave generator are directed to the microwave cooking element through the microwave conduit to cook an item with the microwave cooking element.

These limitations are not disclosed in Nakagawa, Perlman, or Stutman. Indeed, nothing in the combination of Nakagawa with Perlman or Stutman remotely suggests a microwave cooking element located within a vehicle and energized by a microwave generator remotely spaced from the microwave cooking element and interconnected by a microwave conduit. Thus, the combination of Nakagawa with Perlman or Stutman does not render claim 21 obvious to one skilled in the art.

Nakagawa does not disclose an oscillator that is "remotely spaced" from a cooking element, as "remotely spaced" is used in claim 21. Applicants' description of the invention makes clear that "remotely spaced" means that the oscillator is spaced at some significant distance from the cooking element. Examples include locating the oscillator in a vehicle trunk or engine compartment. Nothing in Nakagawa suggests that the oscillator is similarly spaced relative to the cooking chambers. There is nothing in the written description that even suggests that the oscillator is remotely spaced from the cooking chambers.

Furthermore, the figures in Nakagawa show the microwave oven in a schematic representation, and disclose a configuration of oscillator, isolator, waveguides, and cooking chambers that can occupy a single housing. Indeed, Nakagawa discloses an improvement, i.e. the isolator, to the microwave heating device described in Japanese Unexamined Utility Model Application Publication No. 50-58342, which describes a heating chamber divided into two chambers which are connected to a microwave oscillator via a branched waveguide. Thus, Nakagawa must be read as describing no more than a conventional microwave oven with a single

cooking chamber divided into multiple cooking chambers and supplied by a single oscillator through a multi-branched waveguide.

Neither Perlman nor Stutman discloses a microwave generator “remotely spaced” from a microwave cooking element. Both of these references disclose a generally conventional microwave oven having a heating chamber and an oscillator/magnetron located within the oven housing.

4. The Combination Of Nakagawa with Perlman or Stutman Fails To Reach The Claimed Invention of Independent Claim 51.

Independent claim 51 calls for a microwave cup warmer for a vehicle. The cup warmer comprises a microwave cooking element, a microwave generator located remotely from the microwave cooking element, and a microwave conduit. The microwave conduit connects the microwave generator to the microwave cooking element so that microwaves generated by the microwave generator are directed to the microwave cooking element.

The same arguments supporting the error in the rejection of claim 21 are equally applicable to the rejection of claim 51. Because none of the three cited references discloses a microwave generator that is “remotely spaced” from a microwave cooking element, the combination of Nakagawa with either Perlman or Stutman fails to disclose the invention of claim 51.

5. The Combination Of Nakagawa with Perlman or Stutman Fails To Reach The Claimed Invention of Dependent Claims 29-37, 50, 52, and 70

Claims 29-37, 50, 52, and 70 depend, directly or indirectly from either claim 21 or claim 51. As claims 21 and 51 are not obvious over Nakagawa in view of Perlman or Stutman, claims 29-37, 50, 52, and 70, which include the limitations of claims 21 or 51, are not obvious over Nakagawa in view of Perlman or Stutman. Nevertheless, claims 29-37, 50, 52, and 70 are independently patentable over Nakagawa in view of Perlman or Stutman.

The dependent claims will now be individually addressed where warranted with respect to the combination.

a. Claim 31

Claim 31 depends from claim 21, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claim 21, claim 31 also requires that the microwave generator be located in a storage area in the vehicle, which is not disclosed in any proper combination of the three cited references. Thus, claim 31 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 31 is improper and should be overruled.

b. Claim 32

Claim 32 depends from claims 21 and 31, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claims 21 and 31, claim 32 additionally requires that the microwave generator be located in a trunk of the vehicle, which is not disclosed in any proper combination of the three cited references. Thus, claim 32 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 32 is improper and should be overruled.

c. Claim 33

Claim 33 depends from claim 21, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claim 21, claim 33 also requires that the cooking element be located in a console in a passenger compartment of the vehicle, with the console having a selectively closeable cavity forming the cooking element. This is also not disclosed in any proper combination of the three cited references. Thus, claim 33 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 33 is improper and should be overruled.

d. Claim 34

Claim 34 depends from claims 21 and 33, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claims 21 and 33, claim 34 requires that the console be located between spaced front seats, which is also not disclosed in any proper combination of the three cited references. Thus, claim 34 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 34 is improper and should be overruled.

e. Claim 37

Claim 37 depends from claim 21, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claim 21, claim 37 requires the cooking element to comprise a housing having an open-top recess defining a cooking cavity sized to receive a cup, with a movable cover mounted to the housing for selectively closing the open-top cooking cavity with the cup positioned within the cavity. The housing is located within the passenger compartment such that it is accessible by a user of the vehicle. This is not disclosed in any proper combination of the three cited references. Thus, claim 37 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 37 is improper and should be overruled.

f. Claim 50

Claim 50 depends from claims 21 and 37, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claims 21 and 37, claim 50 requires that the cover define an open-bottom recess and the combination of the open-top recess and the cover open-bottom recess define the cooking cavity. This also is not disclosed in any proper combination of the three references. Thus, claim 50 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 50 is improper and should be overruled.

g. Claim 52

Claim 52 depends from claim 51, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claim 51, claim 52 requires that the cooking element comprise a housing having an open-top recess defining a cooking cavity sized to receive a cup. A cover is movably mounted to the housing for selectively closing the open-top cooking cavity with the cup positioned within the cavity. No combination of Nakagawa, Perlman, and Stutman discloses the invention of claim 52. Thus, claim 52 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 52 is improper and should be overruled.

h. Claim 70

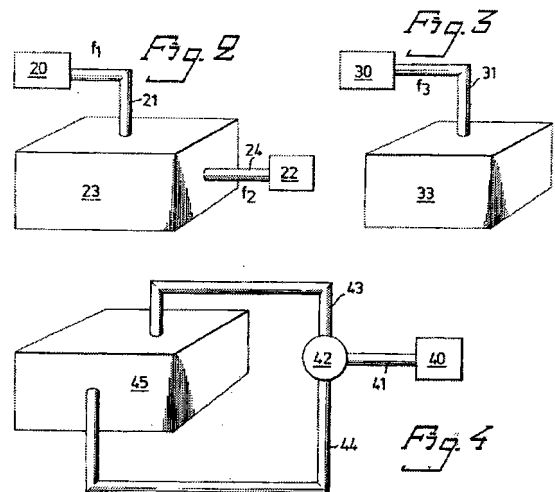
Claim 70 depends from claims 51 and 52, and is, for the same reasons, not obvious over Nakagawa in view of Perlman or Stutman. In addition to the elements of claims 51 and 52, claim 70 requires that the cover define an open-bottom recess and the combination of the housing open-top recess and the cover open-bottom recess define the cooking cavity. No combination of Nakagawa, Perlman, and Stutman discloses this invention. Thus, claim 70 is independently patentable over Nakagawa in view of Perlman or Stutman. The rejection of claim 70 is improper and should be overruled.

B. Claims 22-28, 38-43, and 53-63 are not obvious over Nakagawa in view of Perlman or Stutman, and further in view of U.S. Patent No. 4,323,745 to Berggren

1. The combination of Nakagawa with Perlman or Stutman and Berggren is improper because Berggren is non-analogous prior art

Berggren is directed to the heating of plastics for injection molding in a metal cavity 23, 33, 45 by microwaves supplied by one or more microwave generators 20, 22, 30, 40 connected to the cavity by waveguides 21, 22, 31, 43, 44 respectively. The generator and waveguide configuration is adapted to generate microwaves of different resonance frequency modes, which results in electric field energies that are greater than zero at every point in the cavity 23, and which consequently ensures uniform heating of the plastic. There is nothing in the Description in Berggren to suggest that the microwave generators are remote from the cavity.

Claims 22-28 and 38-43 depend, directly or indirectly, from claim 21. Claims 53-63 depend, directly or indirectly, from claim 51. Claims 22-28, 38-43, and 53-63 all relate to a microwave system for heating food items. Berggren, however, describes a metal cavity for microwave heating of an injection molded plastic. The microwaves must be supplied to the metal cavity at a resonance frequency. However, to avoid points of zero electric energy density which results in non-uniform heating of the material, the microwaves are supplied at different resonance modes by separate waveguides, which can include coaxial conductors. The use of different resonance modes provides uniform heating of the material by eliminating the points of zero electric energy density.



FIGURES 2-4 OF BERGGREN '745

The citation of Berggren by the Examiner in support of a finding of obviousness is improper, and should be overruled. Berggren is non-analogous prior art. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). "A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem." *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 864, 26 USPQ2d 1767 (Fed. Cir. 1993). While Patent Office classification is some evidence of analogy, the similarities and differences in structure and function of the inventions disclosed in the references carry far greater weight. *In re Clay*, 966 F.2d 656, 23 U.S.P.Q.2D (BNA) 1058 (Fed. Cir. 1992).

The first requirement has not been met. Berggren is in a field which is entirely different from the field of Applicants' invention. Berggren is directed to heating of injection molded plastics in a metal cavity which necessarily requires microwaves supplied at a resonance frequency. Rather than microwaves of the same frequency mode being supplied by a plurality of waveguides, microwaves of different frequency modes are supplied in order to ensure uniform heating of the plastic. This is entirely different from the field of art of Applicants' invention, which is directed toward the heating of food in a motor vehicle, using microwaves of a single frequency mode.

Berggren is also not reasonably pertinent to the problem with which Applicants were concerned. The problem to be solved by the reference invention was the nonuniform heating of injection molded plastics. The problem to be solved by Applicants' invention is the provision of microwave heating devices in a motor vehicle.

Finally, the structure and function of the reference invention and Applicants' invention are significantly different. The reference invention comprises a heating chamber which is supplied through a plurality of waveguides with the microwaves at different frequency modes.

The function of the device is to maintain uniform heating of a thermoplastic by use of microwaves of different frequency modes. In contrast, Applicants' invention is a system involving a plurality of heating chambers each of which is supplied by a waveguide branching off from a common waveguide conducting microwaves of the same frequency. The function of Applicants' system is the delivery of microwaves to discrete heating devices located throughout a motor vehicle. A person of ordinary skill seeking to solve the problem of delivering microwaves to discrete heating devices in a motor vehicle would not consider a device whose purpose is to provide microwaves of different frequency modes to a heating chamber for maintaining uniform heating of a thermoplastic. Thus, Berggren is nonanalogous art.

2. The combination of Nakagawa with Perlman or Stutman and Berggren is improper, which removes the basis for the obviousness rejection.

As discussed above, there is no motivation, suggestion, or teaching in Nakagawa, Perlman, or Stutman for combining these references in the manner asserted by the Examiner. The addition of Berggren does not address the shortcomings in the underlying combination of Nakagawa, Perlman, and Stutman. There is also no motivation, suggestion, or teaching in Berggren for combining Berggren with Nakagawa, Perlman, or Stutman in the manner asserted by the Examiner. The Examiner supports the rejection by asserting that it would have been obvious to a person of ordinary skill in the art at the time of invention "to further modify Nakagawa combined with Perlman or Stutman to use a coaxial cable or a branched waveguide as the microwave transmission conduits for feeding microwave energy from the single microwave source to each heating element depending on the overall system requirement, in view of the teaching of Berggren. Obviously, the use of a coaxial cable provides a flexible connection." *12/27/05 Office Action, p. 3*. This assertion is without merit.

The Examiner fails to identify the teaching in Berggren that would lead a person of ordinary skill in the art to modify Nakagawa combined with Perlman or Stutman to use a coaxial cable or a branched waveguide as the microwave transmission conduits for feeding microwave energy from the single microwave source to each heating element depending on the

overall system requirement. The Examiner also fails to identify the “overall system requirement” on which such a modification would depend. In actuality, since the microwave devices of Nakagawa, Perlman, and Stutman have the oscillator/magnetron in the same enclosure as the heating chamber, there is no reason to use a coaxial cable as called for in claims 22-28, 39-43, and 54-63. The Examiner’s reasoning for the obviousness of the combination flawed and cannot be supported. The Examiner is simply relying on hindsight reconstruction of Applicants’ invention and after-the-fact rationalization, both of which are improper and should be rejected.

Thus, the Examiner’s justification for combining Nakagawa with either Perlman or Stutman and Berggren is flawed and should be rejected.

3. Claims 22-28, 38-43, and 53-63 Are Not Obvious In View Of The Combination Assuming It Can Be Made.

The most that the combination of Nakagawa with Perlman or Stutman and Berggren teaches is a generally conventional microwave oven that is adapted for use in a motor vehicle, which comprises an enclosure comprising at least one heating chamber and one or more waveguides interconnected to an oscillator/magnetron, and which can provide microwaves of different frequency modes to the heating chamber for maintaining uniform heating of a thermoplastic. This is not the invention of claims 22-28, 38-43, and 53-63.

4. The Combination Of Nakagawa with Perlman or Stutman and Berggren Fails To Reach The Claimed Invention of Claims 22-28, 38-43, and 53-63.

Claims 22-28 and 38-43 depend, directly or indirectly, from claim 21. As discussed above, the combination of Nakagawa with Perlman or Stutman fails to reach the claimed invention of claim 21. Thus, the combination of Nakagawa with Perlman or Stutman also fails to reach the claimed inventions of claims 22-28 and 38-43. The addition of Berggren fails to remedy the deficiencies in the combination of Nakagawa and Perlman or Stutman. Specifically, none of the four cited references discloses a microwave generator that is “remotely spaced” from

a microwave cooking element, as called for in claim 21. Thus, claims 22-28 and 38-43 are patentable and not obvious over Nakagawa in view of Perlman or Stutman and further in view of Berggren. Nevertheless, claims 22-28 and 38-43 are independently patentable.

a. Claims 22-28

In addition to the elements of claim 21, claim 22 also requires that the microwave conduit comprise a coaxial cable carrying the microwaves from the microwave generator to the cooking element. No combination of Nakagawa, Perlman, Stutman, and Berggren discloses this invention. Thus, claim 22 is independently patentable over Nakagawa in view of Perlman or Stutman, and further in view of Berggren. Claims 23-28 depend from claim 22 and are for the same reasons independently patentable over Nakagawa in view of Perlman or Stutman, and further in view of Berggren. The rejection of claims 22-28 is improper and should be overruled.

b. Claims 38-43

Claims 38-43 depend from claims 21 and 37. In addition to the elements of claims 21 and 37, claims 38-43 also require that the cooking element comprise a housing having an open-top recess defining a cooking cavity sized to receive a cup, and a cover movably mounted to the housing for selectively closing the open-top cooking cavity with the cup positioned within the cavity, wherein the housing is located within the passenger compartment such that it is accessible by a user of the vehicle. No combination of Nakagawa, Perlman, Stutman, and Berggren discloses this invention. Thus claims 38-43 are independently patentable over Nakagawa in view of Perlman or Stutman, and further in view of Berggren. The rejection of claims 38-43 is improper and should be overruled.

c. Claims 53-63

Claims 53-63 depend, directly or indirectly, from claim 51. As discussed above, the combination of Nakagawa with Perlman or Stutman fails to reach the claimed invention of claim 51. Thus, the combination of Nakagawa with Perlman or Stutman also fails to reach the claimed inventions of claims 53-63. The addition of Berggren fails to remedy the deficiencies in the

combination of Nakagawa and Perlman or Stutman. Specifically, none of the four cited references discloses a microwave generator that is "remotely spaced" from a microwave cooking element, as called for in claim 51. Thus, claims 53-63 are patentable and not obvious over Nakagawa in view of Perlman or Stutman and further in view of Berggren.

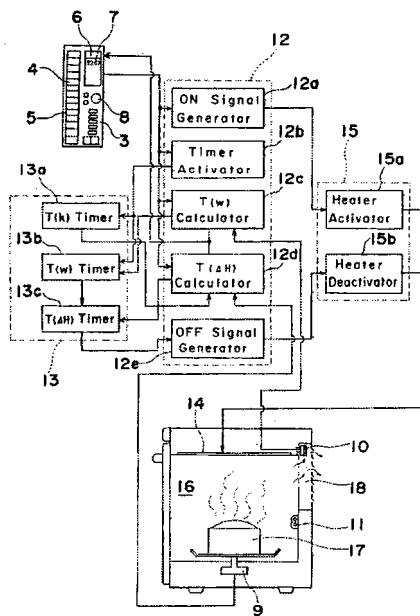


FIGURE 9 OF TAKIZAKI '570

view of Berggren. The rejection of claims 53-63 is improper and should be overruled.

C. Claims 44-49 and 64-69 are not obvious over Nakagawa in view of Perlman or Stutman, and further in view of U.S. Patent No. 5,315,084 to Jensen or U.S. Patent No. 4,814,570 to Takizaki.

1. The combination of Nakagawa, Perlman or Stutman, and Jensen or Takizaki is improper, which removes the basis for the obviousness rejection.

Jensen discloses a baby bottle container 10 having a refrigerated compartment 22 and a separate microwave heating compartment 20. The heating compartment 20 includes a weight

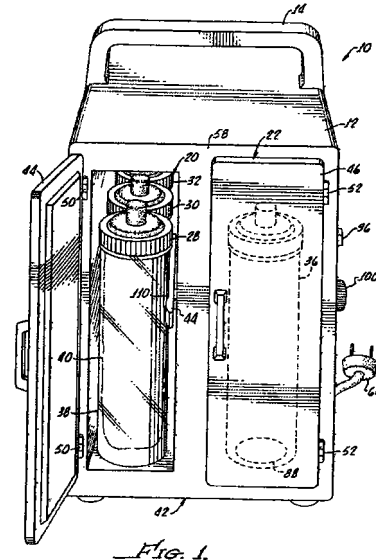


FIGURE 1 OF JENSEN '084

In addition to the elements of claim 51, claims 53-63 also require that the cooking cavity comprise a cup support on which the bottom of the cup will rest when the cup is placed within the cooking cavity. No combination of Nakagawa, Perlman, Stutman, and Berggren discloses this invention. Thus claims 53-63 are independently patentable over Nakagawa in view of Perlman or Stutman, and further in

sensor 88 to enable the heating time to be controlled based upon the weight of the bottle contents.

Takizaki discloses a cooking chamber 1 having a temperature sensor 11, a gas/humidity sensor 10, and a weight sensor 9, the outputs of which are utilized to determine a total cooking time for a food item placed in the cooking chamber.

There is no motivation, suggestion, or teaching in Nakagawa, Perlman, or Stutman for combining these references in the manner asserted by the Examiner. The addition of Jensen and Takizaki does not address the shortcomings in the underlying combination of Nakagawa, Perlman, and Stutman. There is also no motivation, suggestion, or teaching in either Jensen or Takizaki for combining Jensen or Takizaki with Nakagawa, Perlman, or Stutman in the manner asserted by the Examiner. The Examiner supports the rejection by asserting that it would have been obvious to a person of ordinary skill in the art at the time of invention “to modify Nakagawa combined with Perlman or Stutman to use a temperature sensor and/or a weight sensor to monitor the heating conditions of the food material for better heating control and better food product, in view of the teaching of Jensen or Takizaki..” *12/27/05 Office Action, p. 4*. However, the Examiner fails to identify the teaching in Jensen or Takizaki that would lead a person of ordinary skill in the art to modify Nakagawa combined with Perlman or Stutman to use a temperature sensor and/or a weight sensor to monitor the heating conditions of the food material for better heating control and better food product. The Examiner’s reasoning for the obviousness of the combination flawed and cannot be supported. The Examiner is simply relying on hindsight reconstruction of Applicants’ invention and after-the-fact rationalization, both of which are improper and should be rejected.

2. Claims 44-49 and 64-69 Are Not Obvious In View Of The Combination Assuming It Can Be Made.

The most that the combination of Nakagawa with Perlman or Stutman and Jensen or Takizaki teaches is a generally conventional microwave oven that is adapted for use in a motor vehicle, which comprises an enclosure comprising at least one heating chamber and one or more

waveguides interconnected to an oscillator/magnetron, and which includes a weight sensor or a temperature sensor. This is not the invention of claims 44-49 and 64-69.

3. The Combination Of Nakagawa with Perlman or Stutman and Jensen or Takizaki Fails To Reach The Claimed Invention of Claims 44-49 and 64-69.

Claims 44-49 depend, directly or indirectly, from claim 21. As discussed above, the combination of Nakagawa with Perlman or Stutman fails to reach the claimed invention of claim 21. Thus, the combination of Nakagawa with Perlman or Stutman also fails to reach the claimed inventions of claims 44-49. The addition of Jensen or Takizaki fails to remedy the deficiencies in the combination of Nakagawa and Perlman or Stutman. Specifically, none of the cited references discloses a microwave generator that is “remotely spaced” from a microwave cooking element, as called for in claim 21. Thus, claims 44-49 are patentable and not obvious over Nakagawa in view of Perlman or Stutman and further in view of Jensen or Takizaki. Nevertheless, claims 44-49 are independently patentable.

a. Claims 44-49

Claims 44-49 depend from claims 21 and 37. In addition to the elements of claims 21 and 37, claims 44-49 also require a temperature sensor in the cooking cavity for determining the temperature of the contents of a cup, or a load sensor for determining if a cup placed in the cooking cavity has a threshold volume of liquid. No combination of Nakagawa, Perlman, Stutman, Jensen, and Takizaki discloses these inventions. Thus, claims 44-49 are independently patentable over Nakagawa in view of Perlman or Stutman, and further in view of Jensen or Takizaki. The rejection of claims 44-49 is improper and should be overruled.

b. Claims 64-69

Claims 64-69 depend, directly or indirectly, from claim 51. As discussed above, the combination of Nakagawa with Perlman or Stutman fails to reach the claimed invention of claim 51. Thus, the combination of Nakagawa with Perlman or Stutman also fails to reach the claimed inventions of claims 64-69. The addition of Jensen or Takizaki fails to remedy the deficiencies

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in the combination of Nakagawa and Perlman or Stutman. Specifically, none of the cited references discloses a microwave generator that is "remotely spaced" from a microwave cooking element, as called for in claim 51. Thus, claims 64-69 are patentable and not obvious over Nakagawa in view of Perlman or Stutman and further in view of Jensen or Takizaki. Nevertheless, claims 64-69 are independently patentable.

In addition to the elements of claim 51, claims 64-69 also require a temperature sensor in the cooking cavity for determining the temperature of the contents of a cup, or a load sensor for determining if a cup placed in the cooking cavity has a threshold volume of liquid. No combination of Nakagawa, Perlman, Stutman, Jensen, and Takizaki discloses these inventions. Thus, claims 64-69 are independently patentable over Nakagawa in view of Perlman or Stutman, and further in view of Jensen or Takizaki. The rejection of claims 64-69 is improper and should be overruled.

CONCLUSION

In view of the foregoing, it is submitted that the continuing rejection of claims 21-70 is improper and should not be sustained. Therefore, a reversal of the rejection of claims 21-70 is respectfully requested.

Respectfully submitted,
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Dated: October 12, 2006

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VIII. CLAIMS APPENDIX

- 1-20. Cancelled
21. A vehicle in combination with a distributed microwave cooking system, comprising:
a microwave cooking element located within the vehicle and accessible by a user of the vehicle;
a microwave generator located within the vehicle and remotely spaced from the microwave cooking element; and
a microwave conduit connecting the microwave generator to the microwave cooking element such that the microwaves generated by the microwave generator are directed to the microwave cooking element through the microwave conduit to cook an item with the microwave cooking element.
22. The combination of claim 21, wherein the microwave conduit comprises a coaxial cable carrying the microwaves from the microwave generator to the cooking element.
23. The combination of claim 22, wherein the microwave conduit further comprises a waveguide connected to the output of the microwave generator and to one end of the coaxial cable to direct the microwaves from the microwave generator to the coaxial cable for distribution to the cooking element.
24. The combination of claim 23 and further comprising multiple microwave cooking elements located in the vehicle.
25. The combination of claim 24, wherein the microwave conduit further comprises a switch attached to the other end of the coaxial cable, and the switch has multiple outputs to thereby switch the microwaves passing through the coaxial cable amongst the multiple outputs and the microwave conduit further comprises multiple feeder coaxial cables for connecting the switch

outputs to the cooking elements to thereby distribute the microwaves from the microwave generator to the multiple cooking elements.

26. The combination of claim 25, wherein there is a feeder coaxial cable for each of the cooking elements.
27. The combination of claim 24, wherein there are multiple coaxial cables and each coaxial cable connects a different cooking element to the waveguide.
28. The combination of claim 27, wherein the waveguide comprises multiple channels and each channel corresponds to one of the coaxial cables.
29. The combination of claim 21, wherein the vehicle comprises a passenger compartment and the microwave cooking element is located within the passenger compartment.
30. The combination of claim 29, wherein the microwave generator is located within the passenger compartment.
31. The combination of claim 29, wherein the vehicle comprises a storage area and the microwave generator is located in the storage area.
32. The combination of claim 31, wherein the vehicle comprises a trunk that defines the storage area.
33. The combination of claim 21, wherein the passenger compartment comprises a console having a selectively closeable cavity forming the cooking element.
34. The combination of claim 33, wherein the passenger compartment comprises spaced front

seats with the console is located between the spaced front seats.

35. The combination of claim 34, wherein the passenger compartment comprises a dash and a second cooking element is located in the dash and connected to the microwave generator by the microwave conduit.

36. The combination of claim 35, wherein the dash comprises a glovebox defining a selectively closeable cavity forming the second cooking element.

37. The combination of claim 21, wherein the cooking element comprises a housing having an open-top recess defining a cooking cavity sized to receive a cup, and a cover movably mounted to the housing for selectively closing the open-top cooking cavity with the cup positioned within the cavity, wherein the housing is located within the passenger compartment such that it is accessible by a user of the vehicle.

38. The combination of claim 37, wherein the cooking cavity comprises a cup support on which the bottom of the cup will rest when the cup is placed within the cooking cavity.

39. The combination of claim 38, wherein the microwave conduit comprises a coaxial cable having one end coupled to the microwave generator and an other end coupled to the cooking cavity to deliver the microwaves from the microwave generator to the cooking cavity.

40. The combination of claim 39, wherein the coaxial cable has an inner conductor with a portion that extends into the cooking cavity to form an antenna for transmitting the microwaves into the cooking cavity for direct contact with the cup.

41. The combination of claim 40, wherein the antenna is located beneath the cup support.

42. The combination of claim 39 and further comprising a heating element located within cooking cavity, the heating element being made from a microwave lossy material and directly connected to the other end of the coaxial cable such that the microwaves heat the heating element to introduce heat into the cooking cavity.
43. The combination of claim 42, wherein the heating element forms the cup support.
44. The combination of claim 37 and further comprising a temperature sensor located in the cooking cavity for determining the temperature of the contents of the cup.
45. The combination of claim 44, wherein the temperature sensor is an infrared sensor located on the cover such that the infrared sensor overlies the top of a cup positioned within the cooking cavity when the cover closes the cooking cavity.
46. The combination of claim 44, wherein the temperature sensor is a temperature probe that extends into the open top of a cup positioned within the cooking cavity when the cover closes the cooking cavity.
47. The combination of claim 37 and further comprising a load sensor for determining if a cup placed within the cooking cavity has a threshold volume of liquid.
48. The combination of claim 47, wherein the load sensor is weight sensor that detects a threshold weight for the load.
49. The combination of claim 47, wherein the load sensor comprises an excess microwave sensor for detecting the microwaves not absorbed by the contents of the cup.
50. The combination of claim 37, wherein the cover defines an open-bottom recess and the

combination of the housing open-top recess and the cover open-bottom recess define the cooking cavity.

51. A microwave cup warmer for a vehicle, comprising:
a microwave cooking element for warming the contents of a cup;
a microwave generator located remotely from the microwave cooking element; and
a microwave conduit connecting the microwave generator to the microwave cooking element such that the microwaves generated by the microwave generator are directed to the microwave cooking element through the microwave conduit to cook an item with the microwave cooking element.
52. The microwave cup warmer of claim 51, wherein the cooking element comprises a housing having an open-top recess defining a cooking cavity sized to receive a cup, and a cover movably mounted to the housing for selectively closing the open-top cooking cavity with the cup positioned within the cavity.
53. The microwave cup warmer of claim 52, wherein the cooking cavity comprises a cup support on which the bottom of the cup will rest when the cup is placed within the cooking cavity.
54. The microwave cup warmer of claim 53, wherein the microwave conduit comprises a coaxial cable having one end coupled to the microwave generator and an other end coupled to the cooking cavity to deliver the microwaves from the microwave generator to the cooking cavity.
55. The microwave cup warmer of claim 54, wherein the coaxial cable has an inner conductor with a portion that extends into the cooking cavity to form an antenna for transmitting the microwaves into the cooking cavity for direct contact with the cup.

56. The microwave cup warmer of claim 55, wherein the antenna is located beneath the cup support.

57. The microwave cup warmer of claim 56 and further comprising a heating element located within the cooking cavity, the heating element being made from a microwave lossy material and directly connected to the other end of the coaxial cable such that the microwaves heat the heating element to introduce heat into the cooking cavity.

58. The microwave cup warmer of claim 57, wherein the heating element forms the cup support.

59. The microwave cup warmer of claim 54, wherein the microwave conduit further comprises a waveguide having one portion connected to the microwave generator and another portion connected to the one end of the coaxial cable to couple the coaxial cable to the microwave generator.

60. The microwave cup warmer of claim 59, wherein the coaxial cable has an inner conductor with a portion that extends into a channel formed in the interior of the waveguide to permit the transmission of the microwaves from the microwave generator, through the waveguide, and into the inner conductor.

61. The microwave cup warmer of claim 60, wherein the portion of the inner conductor extending into the waveguide is tapered.

62. The microwave cup warmer of claim 61, wherein the portion of the inner conductor extending into the waveguide is spaced $1/4$ of a wavelength of the microwaves upstream from an end of the waveguide.

63. The microwave cup warmer of claim 62 and further comprising an impedance tuner located within the channel upstream of the portion of the inner conductor extending into the waveguide.
64. The microwave cup warmer of claim 52 and further comprising a temperature sensor located in the cooking cavity for determining the temperature of the contents of the cup.
65. The microwave cup warmer of claim 64, wherein the temperature sensor is an infrared sensor located on the cover such that the infrared sensor overlies the top of a cup positioned within the cooking cavity when the cover closes the cooking cavity.
66. The microwave cup warmer of claim 64, wherein the temperature sensor is a temperature probe that extends into the open top of a cup positioned within the cooking cavity when the cover closes the cooking cavity.
67. The microwave cup warmer of claim 52, and further comprising a load sensor for determining if a cup placed within the cooking cavity has a threshold volume of liquid.
68. The microwave cup warmer of claim 67, wherein the load sensor is weight sensor that detects a threshold weight for the load.
69. The microwave cup warmer of claim 68, wherein the load sensor comprises an excess microwave sensor for detecting the microwaves not absorbed by the contents of the cup.
70. The microwave cup warmer of claim 52, wherein the cover defines an open-bottom recess and the combination of the housing open-top recess and the cover open-bottom recess define the cooking cavity.

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IX. EVIDENCE APPENDIX

No evidence has been entered by the Examiner or Appellants into the record.

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Group Art Unit: 3742

X. RELATED PROCEEDINGS APPENDIX

There being no decision rendered by a court or the Board in any related proceeding, none is listed here.

APPENDIX A

(19) Japanese Patent Office (JP)
(12) Official Gazette of Unexamined Patent Applications (A)

(11) Patent Application Publication Number: 64-30194
(43) Patent Application Publication Date: February 1, 1989

(51) Int. Cl. ⁴	Identification Code	Internal File Nos.
H 05 B 6/74		D-7254-3K

Request for Examination: Not Yet Requested
Number of Inventions [Independent Claims]: 1 (Total of 3 Pages)

(54) Title of the Invention: Microwave Heating Device

(21) Application Number: 62-184013

(22) Application Date: July 23, 1987

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(74) Agent: Toshio NAKAO, Patent Attorney (and 1 other)

Specification

1. Title of the Invention

Microwave Heating Device

2. Claim

A microwave heating device comprising a microwave oscillator, an isolator connected to the oscillator, a branched waveguide attached to the isolator with more than one branched end on the other side, and microwave heating chambers connected to the branch ends on the other side of the branched waveguide.

3. Detailed Description of the Invention

Industrial Field of Application

The present invention relates to a microwave heating device.

Prior Art

Heating devices using microwaves have become remarkably popular in recent years. The uses of these devices have also expanded. For example, microwave ovens are used to cook dinner and high-frequency microwave ovens are used to cook baked goods.

However, there is growing demand for two or more microwave ovens per household. Purchasing them separately is both expensive and uneconomical. In response to this demand, a method has been proposed for selectively supplying microwaves from a single microwave generator to one of two heating chambers (see Japanese Unexamined Utility Model Application Publication No. 50-58342). Here, the heating chamber is divided into two and the divided heating chambers are connected to the microwave oscillator via a branched waveguide. An electromagnetic blocking plate is used to direct the microwaves to one or both chambers.

Problem Solved by the Invention

Unfortunately, some of the microwaves supplied to the microwave heating chambers from the microwave oscillator via the branched waveguide are reflected back. These microwaves reflected back have an adverse effect on the microwave oscillator.

In light of this situation, the purpose of the present invention is to block the microwaves reflected back from the microwave heating chambers.

Means of Solving the Problem

In order to achieve this purpose, an isolator is attached to the branched waveguide connecting the microwave oscillator to the microwave heating chambers in the microwave heating device of the present invention.

Operation

Even though the microwaves generated by the microwave oscillator reflect off the microwave heating chambers in this configuration, the reflected waves are

blocked by the isolator and thus prevented from reaching the microwave oscillator.

Working Examples

The following is an explanation of working examples of the present invention with reference to the drawings.

FIG 1 is a simplified perspective view of the microwave heating device in the working example of the present invention. FIG 2 is a block diagram of this device.

The microwave output terminal on the microwave oscillator 1 is attached to one end of the coaxial waveguide 2, and the other end of the coaxial waveguide 2 is attached to the opening at one end of the isolator 3. The coaxial waveguide 2 is not shown in FIG 1.

One end of the branched waveguide 4 is connected to the opening at the other end of the isolator 3, and shutters 5, 6 that are opened and closed to guide the microwaves in the intended direction are installed at the branch in the branched waveguide 4. Motors 7, 8 are used to open and close the shutters 5, 6. The number of branches at the end of the branched waveguide 4 corresponds to the number of microwave heating chambers 9, 10.

In this working example, one of the shutters 5, 6 is opened and the other is closed to selectively supply microwaves from the microwave isolator 1 to one or the other microwave heating chamber 9, 10.

FIG 3 is a simplified perspective view of the microwave heating device in another working example of the present invention.

This working example differs structurally from the one in FIG 1 in that a single shutter 11 is used to supply microwaves to one or the other microwave heating chamber 9, 10. In other words, a single shutter 11 is installed at the branch in the branched waveguide 4, and a single motor 12 is used to open one of the branches and close the other one.

Therefore, this has a simpler configuration than the working example shown in FIG 1.

By installing a branched waveguide with three or more branches and installing shutters on these branches, microwaves can be supplied selectively to multiple microwave heating chambers.

Effect of the Invention

As explained above, because an isolator is arranged between the microwave oscillator and the microwave heating chambers, the microwaves reflected back from the heating chambers can be blocked, and multiple microwave heating chambers can be used.

4. Brief Explanation of the Drawings

FIG 1 is a simplified perspective view of the microwave heating device in the working example of the present invention. FIG 2 is a block diagram of this device. FIG 3 is a simplified perspective view of the microwave heating device in another working example of the present invention.

1 ... microwave oscillator, 3 ... isolator, 4 ... branched waveguide, 5, 6 ... shutters, 9, 10 ... microwave heating chambers, 11 ... shutter

Agent Toshio NAKAO, Patent Attorney (and 1 other)

FIG 1

- 1 ... microwave oscillator
- 3 ... isolator
- 4 ... branched waveguide
- 5, 6 ... shutters
- 9, 10 ... microwave heating chambers

FIG 2

- 1 ... microwave oscillator
- 2 ... coaxial waveguide
- 3 ... isolator
- 5 ... shutter
- 6 ... shutter
- 9 ... microwave heating chamber
- 10 ... microwave heating chamber

FIG 3

- 11 ... shutter

APPENDIX B

⑩ 日本国特許庁(JP)

⑪ 特許出願公開

⑫ 公開特許公報(A)

昭64-30194

⑮ Int. Cl.⁴

識別記号

庁内整理番号

⑬ 公開 昭和64年(1989)2月1日

H 05 B 6/74

D-7254-3K

審査請求 未請求 発明の数 1 (全3頁)

⑭ 発明の名称 マイクロ波加熱装置

⑯ 特 願 昭62-184013

⑰ 出 願 昭62(1987)7月23日

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明 細 書

1、発明の名称

マイクロ波加熱装置

2、特許請求の範囲

マイクロ波発振器と、この発振器に接続されたアイソレータと、このアイソレータに一方の端部が接続され、他方の端部側が複数に分岐されている分岐導波管と、この分岐導波管の他方の端部にそれぞれ接続されているマイクロ波加熱室とを備えていることを特徴とするマイクロ波加熱装置。

3、発明の詳細な説明

産業上の利用分野

本発明はマイクロ波加熱装置に関するものである。

従来の技術

近年、マイクロ波を利用した加熱装置の普及は目ざましく、たとえば、調理用電子レンジとして用いられたり、または趣味の焼き物などのためのいわゆる高周波加熱炉として用いられたりして、その用途は広汎にわたっている。

ところで、上述したような需要が一つの家庭にあれば、電子レンジが2台以上必要となり、費用もかなり不経済であることから、1台のマイクロ波発生源を用いて、二つの加熱槽のいずれか一方に選択的にマイクロ波を供給するという方法が請じられている(例：実開昭50-58342号公報)。それによれば、加熱槽を二分割し、分割された各室とマイクロ波発振器との間を多岐導波管で連結し、各室へのマイクロ波供給を切換自在の電磁遮蔽板で行うというものである。

発明が解決しようとする問題点

しかしながら、このような従来の方法では、マイクロ波発振器から多岐導波管を通してマイクロ波加熱室に供給されるマイクロ波の一部が反射して、マイクロ波発振器にしばしば悪影響を与えることが明らかとなった。

本発明は上記従来の問題点を解決するもので、マイクロ波加熱室から反射するマイクロ波を阻止することを目的とする。

問題点を解決するための手段

この目的を達成するために、本発明のマイクロ波加熱装置は、マイクロ波発振器と複数のマイクロ波加熱室とを、アイソレータを介して分岐導波管で接続した構成としている。

作 用

この構成によりマイクロ波発振器側から発せられたマイクロ波がマイクロ波加熱室で反射されることがあっても、その反射波はアイソレータで阻止され、マイクロ波発振器側へ伝搬することがない。

実 施 例

以下、本発明の実施例について、図面を用いて説明する。

第1図は本発明のマイクロ波加熱装置の一実施例の要部斜視図、第2図はそのブロック図である。

マイクロ波発振器1のマイクロ波出力端子は同軸導波管2の一端側に組付けられ、この同軸導波管2の他端開口部にはアイソレータ3の一方の開口端部が連結されている。なお、第1図では同軸導波管2については図示されていない。

11を配置しておき、それをモータ12で分岐路の一方を開、他方を閉とするものである。

これによれば、第1図に示した実施例に比べて構成を簡単化できる。

なお、分岐導波管の分岐路を三つ以上とし、その分岐部分にシャッターを設けることによって、多数のマイクロ波加熱室を配置し、それに選択的にマイクロ波を供給することができる。

発明の効果

以上のように本発明によれば、マイクロ波発振器とマイクロ波加熱室との間にアイソレータを介在させているので、加熱室から反射するマイクロ波を阻止できるとともに、マイクロ波加熱室の多目的利用を可能にすることができる。

4、図面の簡単な説明

第1図は本発明の一実施例におけるマイクロ波加熱装置の要部斜視図、第2図はそのブロック図、第3図は本発明の他の実施例の要部斜視図である。

1……マイクロ波発振器、3……アイソレータ、4……分岐導波管、5、6……シャッター、9、

アイソレータ3の他方の開口端部には分岐導波管4の一端が接続されており、この分岐導波管4の分岐位置にはそれを任意の分岐方向へ案内するためのシャッター5、6が開閉自在に配置されている。7、8はこれらシャッター5、6を開閉するためのモータである。分岐導波管4の他方の端部には分岐数に相当する数(この実施例では二つ)のマイクロ波加熱室9、10が連結されている。

この実施例によれば、シャッター5、6の一方を開き、他方を閉じておくことにより、マイクロ波発振器1からのマイクロ波をマイクロ波加熱室9、10のいずれか一方に選択的に供給することができる。

第3図は本発明の他の実施例の要部斜視図である。

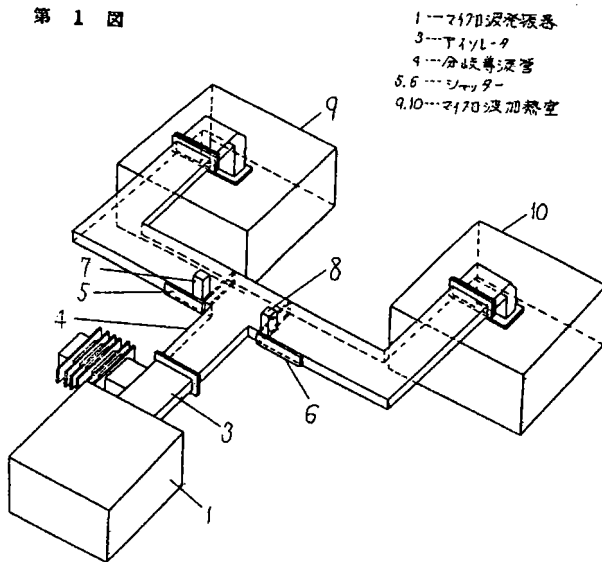
この実施例は第1図に示した実施例の構造的にもっとも異なるのは、マイクロ波加熱室9、10のいずれかへのマイクロ波供給を一つのシャッター11で切り替えるよう構成していることである。すなわち、分岐導波管4の分岐部分にシャッター

10……マイクロ波加熱室、11……シャッター。

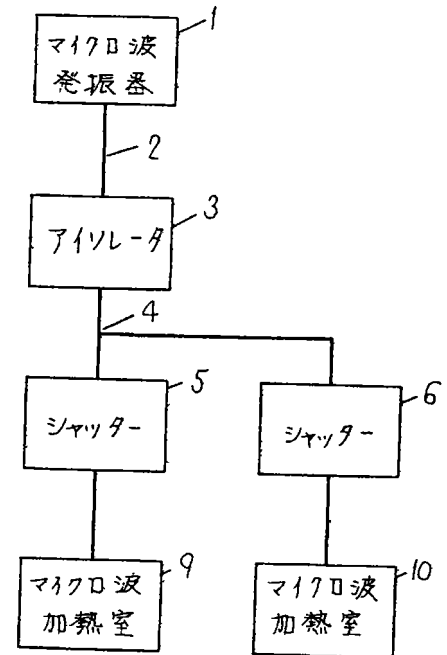
代理人の氏名 井理士 中尾 敏男 ほか1名

第 2 図

第 1 図



2...同軸導波管



第 3 図

